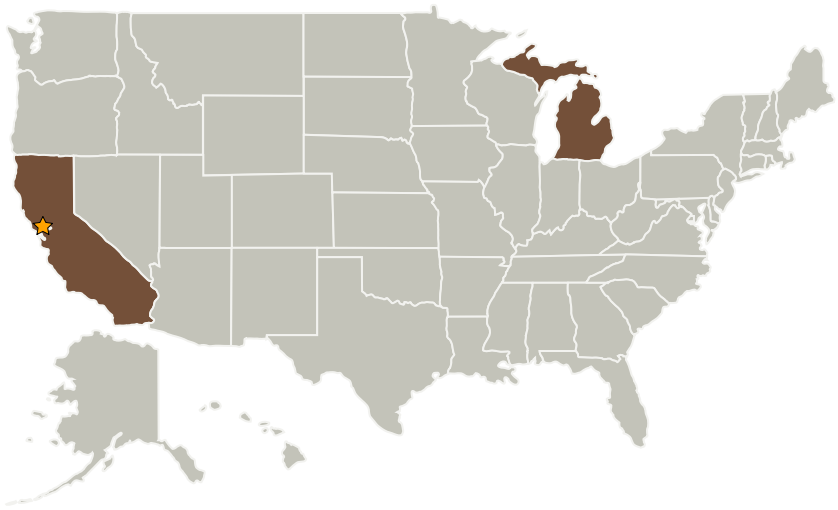
Utilizing High Fidelity Simulations in Multidisciplinary Optimization of Aircraft Systems, Phase I

Completed Technology Project (2008 - 2008)

Project Introduction

Aircraft design is a complex process requiring interactions and exchange of information among multiple disciplines such as aerodynamics, strength, fatigue, controls, propulsion, corrosion, maintenance, and manufacturing. A lot of attention has been paid during the past fifteen years in the Multi-disciplinary Design Optimization (MDO) nature of the aircraft design process. However, a consistent void in aircraft design is the ability to integrate high-fidelity computational capabilities from multiple disciplines within an organized MDO environment. Integrating high fidelity simulation technology (that has been developed over the years though significant investments) within a MDO environment will constitute a disruptive technological development in aircraft design. Currently, each high fidelity simulation is rather compartmentalized, and at best a sequential interaction process is exercised. Integrating the high-fidelity computational capabilities from multiple disciplines within an organized MDO environment will provide the ability to capture the implications that design changes in a particular discipline have to all other disciplines. It will also be possible to share design variables among disciplines and thus identify the direction that design variables should follow based on objectives and constraints from multiple disciplines. During the Phase I effort the feasibility of utilizing high fidelity CFD simulations for shape optimization and combining them with a structural finite element simulation for strength considerations within a multi-discipline design optimization environment will be demonstrated. A wing configuration will be analyzed for showcasing the different steps of this development and the benefits.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Ames Research Center (ARC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Ames Research Center(ARC)	Lead Organization	NASA Center	Moffett Field, California
Michigan Engineering Services, LLC	Supporting Organization	Industry Women-Owned Small Business (WOSB)	Ann Arbor, Michigan

Primary U.S. Work Locations	
California	Michigan

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Jim He

Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.1 Aerosciences
    - TX15.1.3 Aeroelasticity